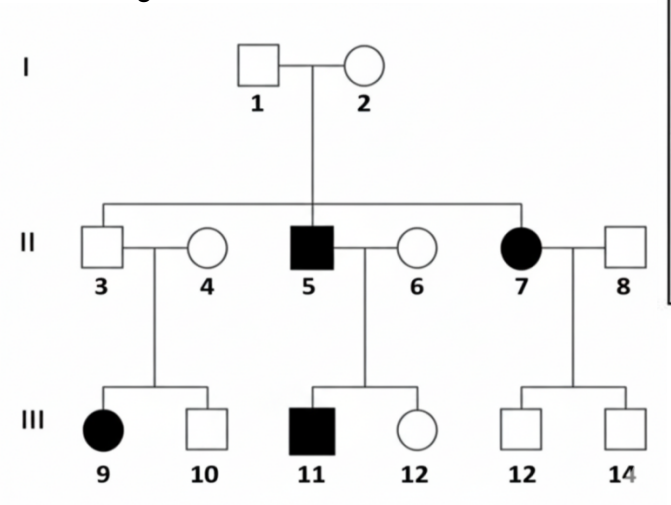
Chapter 3 classical genetics

Questions 1-2

The following pedigree shows the family history of inheriting Gaucher disease.



1) What is the most appropriate mode of inheritance of this disease?

a) sex-linked dominant
b) sex-linked recessive
c) autosomal recessive
d) autosomal dominant
e) nondisjunction

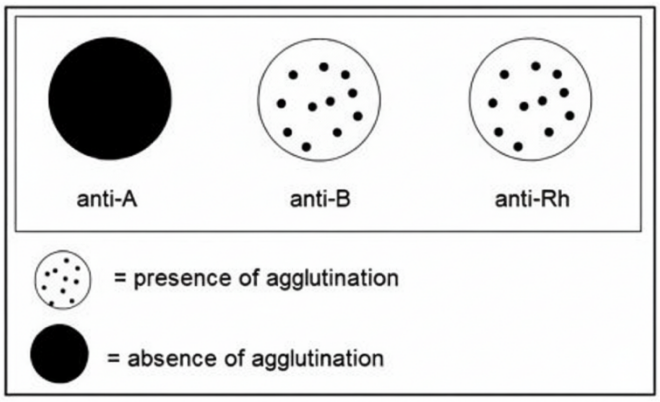
2) If the couple 3 and 4 from generation II have another child, how likely is the child to inherit the disease?

a) 100%
b) 50%
c) 25%
d) 0%
e) It cannot be determined based on the data provided.

3) What is most likely the genotype of person number 6 from generation II?

a) GG
b) Gg
c) gg
d) X^GX^g
e) X^G X^G

Kevin wants to know his blood type. He took a drop of his blood and mixed it with three types of antibodies separately: anti-A, anti-B and anti-Rh. The results are found in the chart below.



4) According to the chart Kevin's blood type is:

a) A+
b) B+
c) A
d) B
e) AB+

5) A man who is heterozygous type A+ married a woman who is heterozygous type B+. Which of these blood types will their child most probably have?

a) blood type O+
b) blood type A+
c) blood type B+
d) blood type AB+
e) All the above blood types have the same probability of occurrence.

6) In ladybugs, the size of the black spots is determined by a gene. Large spots are dominant over small spots. In addition, having a curved antenna dominates having straight ones. If a male ladybug that has large spots and a curved antenna and has a mother with small spots and a straight antenna is allowed to mate with a female ladybug having large spots and a straight antenna whose father has small spots, what

will be the probability of having offspring with small spots and a straight antenna?

a) 1/16
b) 2/16
c) 3/16
d) 4/16
e) 8/16

Cross	Parents		Offspring	
	Female	× Male	Gray	White
I	gray	× white white	82	78
II	gray	× gray gray	118	39
III	white	× white white	0	50
IV	gray	× white white	74	0

7) If the gray female from cross IV mated with the gray male from cross II, then which of the following would most likely be true?

a) All of the offspring would be gray.
b) All of the offspring would be white.
c) Half of the offspring would be gray.
d) One-quarter of the offspring would be gray.
e) One-quarter of the offspring would be white.

8) If two gray progeny of cross IV mate with each revealed progeny of cross IV mate with each other, what is the probability that any one individual offspring will be gray?

a) 100%
b) 75%
c) 50%
d) 25%
e) 0

9) The ABO blood type system is a system that codes for agglutinogen at the level of red blood cells thus determining the blood type. Blood transfusions are conducted in several cases such as bleeding. The possible transfusion according to the ABO blood type system is

a) A → AB
b) AB → A
c) A → O
d) AB → O
e) AB → B

10) A test cross is done to

a) determine if crossover has occurred.
b) prevent sex-linked traits from being passed on.
c) determine if a person has Huntington's disease.
d) prevent crossover from occurring.
e) determine if an organism with the dominant phenotype is homozygous dominant or Hybrid.

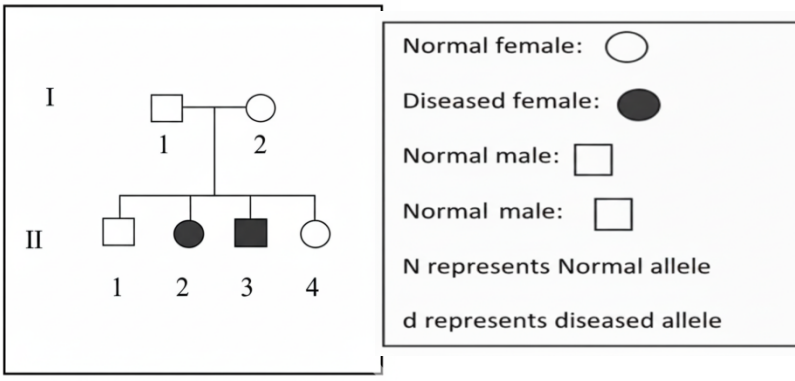
11) The gene for color blindness is carried on the non-homologous segment of sex chromosome X. The allele for color blindness is recessive. We can conclude that

I. Sons cannot inherit color blindness from their fathers.
II. The chance for a carrier mother and a normal father to have color blind boys is 50% of children.
III. A color blind mother and a normal father have all their boys having color blindness.
IV. The chance for a carrier mother and a color blind father to have color blind girls is 25%.

a) I only
b) III only
c) I, II and III
d) II, III, and IV
e) I, III, and IV

Questions 13, 14, 15

The following pedigree shows the transmission of an autosomal recessive disease in a certain family.



12) The genotype of individual I 1 is

a) NN
b) Nd
c) dd
d) Maybe NN or Nd
e) Maybe Nd or dd

13) The genotype of individual II 2 is

a) NN
b) Nd
c) dd
d) Maybe NN or Nd
e) Maybe Nd or dd

14) The genotype of individual II 4 is

a) NN
b) Nd
c) dd
d) Maybe Nd or dd
e) Maybe NN or Nd

Questions 15,16,17, 18 & 19

Cross	Resut	Result
I	Long stem plants × short stem plants	100% long stem plants
II	Short stem plants × short stem plants	100% short stem plants
III	Long stem plants × long stem plants	60 long stem plants and 20 short stem plants
IV	Long stem plants × short stem plants	80 long stem plants and 79 short stem plants

15) The genotype of parents in cross III

a) Both have LL
b) Both have Ls
c) Both have ss
d) One has LL and the other has Ls
e) One has Ls and the other has ss

16) Cross IV is

a) A test cross done between pure long and pure short stem plants
b) A test cross done between pure long and hybrid short stem plants
c) Self cross done between hybrid long and hybrid short stem plants
d) A test cross done between hybrid long and pure short stem plants
e) A test cross done between hybrid long and hybrid short stem plants

17) If one of the plants obtained in cross II is crossed with a plant obtained from cross I, the result would be

a) 75% long stem plants (LL) and 25% short stem plants (ss)
b) 50% long stem plants (Ls) and 50% short stem plants (ss)
c) 50% long stem plants (LL) and 50% short stem plants (ss)
d) 100% plants having long stem with genotype (Ls)
e) 100% plants having short stem with genotype (ss)

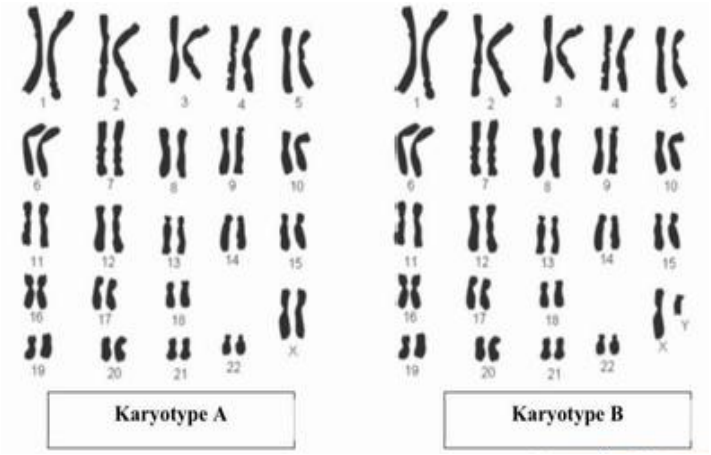
18) In the ABO blood group system, the alleles behave as follows:

a) A//A is the genotype of group A which is homozygous
b) A//B is the genotype of group A which is heterozygous
c) A//O is the genotype of group A which is homozygous
d) The two alleles A and O are codominant
e) Allele A is dominant over allele B

19) In a dihybrid cross with independent genes present on different autosomes, the phenotypic proportion of F2 generation is:

a) 1/4 - 1/4 - 1/4 - 1/4
b) 1/2 - 1/2
c) 3/4 - 1/4
d) 9/16 - 3/16 - 3/16 - 1/16
e) 8/9 - 3/9 - 3/9 - 1/9

20) A karyotype shows the number and appearance of chromosomes in the nucleus of a eukaryotic cell. Consider the following two karyotypes:



Which statement correctly reflects the gender?

a) Karyotype A belongs to a male because of the presence of XX pair
b) Karyotype B belongs to a female because of the presence of XY pair
c) Karyotype B belongs to a male because of the presence of XY pair
d) Karyotype B belongs to an abnormal female because of the presence of two chromosomes XY
e) Karyotype A belongs to an abnormal female because of the presence of two chromosomes XX

21) In the case of pea plants, tall (T) is dominant over dwarf (t). What is the genotype of the parents of a generation of plants half of which are tall and half of which are dwarf?

a) Tt × tt
b) Tt × Tt
c) TT × tt
d) $X_TX^t \times X^TX^t$
e) $X^T X^T \times X^tX^t$

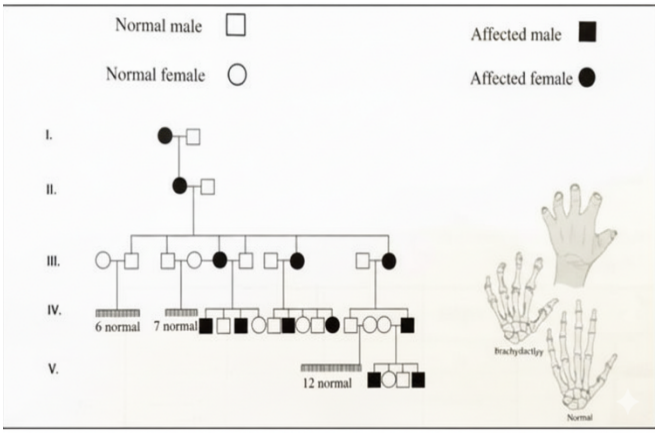
22) In a rabbit, the gene coding for the color of hair and the gene coding for the length of hair are independent. Yellow female rabbits having long hair are crossed with yellow male rabbits having long hair. The resulting offspring have the following phenotype:

90 yellow body with long hair
30 black body with long hair
30 yellow body with short hair
10 black body with short hair

The results show that:

a) There exists a lethal allele
b) It is the normal result of a self-cross where the allele for yellow is dominant over the allele for black hair and the alleles short hair and long hair are codominant alleles
c) It is the normal result of a self-cross where the allele for black is dominant over the allele for yellow hair
d) The allele for yellow is dominant over the allele for black hair and the allele for long hair is dominant over the allele for short hair
e) The allele for yellow is dominant over the allele for black hair and the allele for short hair is dominant over the allele for long hair

23) The following pedigree shows the transmission of the Brachydactyly (short fingers) trait in a family.



The analysis of the pedigree shows that the allele responsible for the abnormality is:

a) Dominant over the allele for normal length of the fingers
b) Recessive and dominated by the normal allele
c) Codominant with the normal allele
d) Dominant in males and recessive in females
e) Dominant in females and recessive in males

24) A man who is color-blind marries a woman who has normal color vision and does not carry the trait for color blindness. What statement will be true of their children if the disease is sex-linked disease?

a) All their sons will be normal, and all their daughters will be carriers

b) All their sons will be normal, and all their daughters will be color-blind

c) All their sons will be color-blind, and all their daughters will be normal

d) All their sons will be color-blind, and all their daughters will be carriers

e) All their daughters will be carriers, but the genotype of the sons cannot be determined

25) A black animal is crossed with a white animal and all the offspring are black. Which pattern of inheritance is at work?

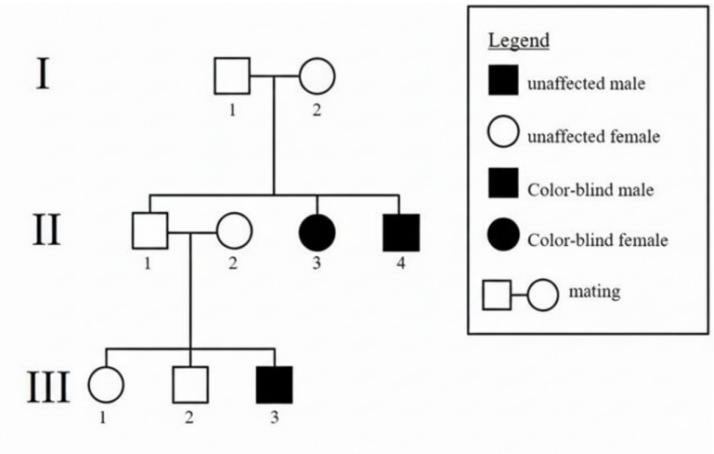
a) Law of dominance
b) Law of segregation
c) Incomplete dominance
d) Codominance
e) Sex-linked inheritance

26) In butterflies, branched veins on wings is dominant over parallel veins, and orange color is dominant over yellow. If two heterozygous butterflies for these traits mate, what is the probability of having yellow offspring with branched veins on wings?

a) 9/16
b) 3/16
c) 16/16
d) 1/16
e) 1/2

Questions 27–28: Refer to the given below

Color-blindness is a sex-linked recessive disease.
The following pedigree shows the inheritance of color-blindness in a family.



27) How can the female in II-3 be color-blind knowing that her parents have normal vision?

a) she has Turner's syndrome
b) she received a defected X chromosome from her father
c) she had a genetic mutation after birth
d) she was wrongly diagnosed with color-blindness
e) she received a defected X from her grandmother (father's mother)

28) What is the probability for individual III-1 to be born color-blind?

a) 0%
b) 25%
c) 75%
d) 100%
e) cannot be determined from the pedigree

29) A man with an unknown blood type needs an urgent blood transfusion. What is the safest choice of blood type that could be given to this man?

a) A+
b) AC
c) O+
d) O
e) AB-

30) In a family of three boys, the probability of having a girl in a subsequent pregnancy is:

a) 100%
b) 75%
c) 50%
d) 25%
e) 0%

31) In rabbits, the gene coding for hair color and that for the hair length are independent. Grey female rabbits having long hair are crossed with grey male rabbits having long hair. The resulting offspring have the following phenotype:

90 grey body with long hair
30 white body with long hair
30 grey body with short hair
10 white body with short hair

The results show that:

a) There exists a lethal allele.

b) It is the normal result of a self-cross where the allele grey is dominant over the allele for white hair.

c) It is the normal result of a self-cross where the allele for white is dominant over the allele for grey hair.

d) The allele for grey is dominant over the allele for white hair and the allele for long is dominant over the allele for short hair.

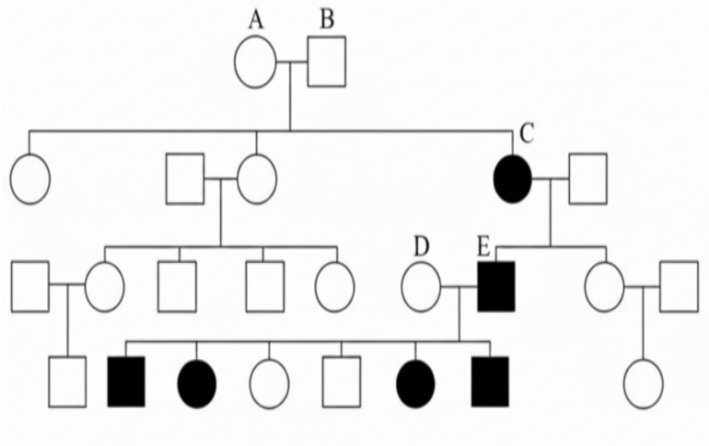
e) The allele for grey is dominant over the allele for white hair and the allele for short hair is dominant over the allele for long hair.

32) During karyotype preparation, the dividing cells are blocked at:

a) Prophase
b) Metaphase
c) Anaphase
d) Telophase
e) Interphase

Questions 33–34:

The following pedigree shows the inheritance of the color of eyes.



33) Which is true of the shaded-in trait?

a) The trait is autosomal recessive.
b) The trait is autosomal dominant.
c) The trait is sex-linked dominant.
d) The trait is sex-linked recessive.
e) The trait is inherited as incomplete dominance.

34) What is the most likely genotype for person C?

a) AA
b) Aa
c) aa
d) $X^A X^A$
e) $X^A X^a$

35) Concerning the blood groups, the gene of the ABO system is located on the chromosome 9 and the gene of the rhesus system is located on the chromosome 1. What is the genotype of an individual whose Rh is negative and has AB blood type?

a) A//B, Rh-//Rh-
b) A//A, B//B, Rh-//Rh-
c) A//Rh-, B//Rh-
d) A Rh-//B Rh-
e) A//B, Rh+//Rh-

36) A farmer planted 1000 seeds of corn. The offspring was 544 tall with yellow seeds, 188 tall with green seeds, 183 short with yellow seeds, and 64 short with green seeds. What were the genotypes of the parents?

a) TTYY × ttyy
b) TtYy × ttyy
c) ttyy × ttyy
d) ttyy × TtYy
e) TtYy × TtYy

37) A subject with the following genotype: A//a, B//B, c//c, D//d, can form a number of genetically different gametes equal to:

a) 2
b) 4
c) 6
d) 8
e) 16

38) A man with hemophilia marries a woman who has normal hemoglobin and is not a carrier. Which of the following is true?

a) None of their children will have the disease nor will they be carriers.
b) All the boys will have the disease.
c) All the girls will have the disease.
d) All the boys will be carriers.
e) All the girls will be carriers.